BOROUGH OF SOUTHEND-ON-SEA

A SUMMARY OF A LECTURE

ON MATTERS CONNECTED WITH THE

LIFE AND HEALTH OF THE PUBLIC

BY

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HEALTH DEPARTMENT,

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To The Health Committee.

Mr. Chairman and Gentlemen,

In accordance with your instructions, I have summarised the lecture I gave before the Athenæum, and beg to express my appreciation of the honour you have done me in considering such a summary would be for the public benefit.

I have also had a communication from Dr. J. C. Thresh, the County Medical Officer of Health, asking me for a copy of the summary, and expressing his opinion that the benefit of my lecture will not be confined to this Borough, but will be felt elsewhere.

I am sure the Committee will be glad to know that their decision to print and distribute a summary of the lecture is thus independently endorsed by so eminent a sanitarian as Dr. Thresh.

I have divided the summary into four parts :—

Part I. briefly summarising what I said concerning general and industrial points of interest connected with bacteria.

Part II. dealing with bacteria as disease producers, and with the duties of towncraft in preventing the development of such.

Part III. dealing with small-pox and vaccination.

Part IV. giving (1) General Rules of Cleanliness.

(2) Necessary Precautions to be taken by householders to limit the spread of Infectious Diseases.

These last two parts will be printed in large numbers and widely distributed.

I am, Mr. Chairman and Gentlemen,

Your obedient servant,

J. T. C. NASH,

Medical Officer of Health.

PART I.

FUNCTIONS OF BACTERIA.

Bacteria are almost ubiquitous on the surface of the earth. They abound on our bodies, in our habitations, in the soil, in the food we eat, and the water we drink, and in the air we breathe. Their functions in the economy of nature are very varied.

Colour Production.

Some bacteria produce vivid pigments, others are non-chromogenic. One bacillus commonly found in the air, when grown on potatoes produces a brilliant blood-red colour. If this bacterium gains access to milk exposed in the air the milk is liable to become red in colour, particularly on the surface. In 1843 in Paris this bacterium was very prevalent in the military bakehouses, and produced a red coloration of the bread.

There can be little doubt that it is the presence of this organism which at rare intervals causes the fall of red rain or blood rain, a phenomenon which is looked upon with great awe by the superstitious. It is equally certain that it was the growth of this organism on bread which enabled those so disposed to play on the superstitious feelings of the ignorant masses in the Middle Ages, by representing wafer made of such bread to be a miraculous dispensation of "the bleeding host." Other natural pigments in milk, blue, yellow and green are also the work of various bacteria.

Light Production.

Certain light-producing or photogenic bacteria are the cause of the phosphorescence which is often in the sea. These bacteria can be cultivated in suitable media, and emit sufficient light to enable photographs of their cultures to be taken by their own light. Many kinds of fish, when getting stale, will be seen to be outlined in mysterious phosphorescence if looked at in complete darkness. This phosphorescence is due to myriads of bacteria.

Professor Gorham has succeeded in extracting from decayed beef steak sufficient illumination to take photographs of the laboratory apparatus.

Ferment Production.

Most bacteria produce various kinds of ferments. These ferment producing or zymogenic bacteria are of great importance in various directions. The success or non-success of certain of our industries, such as butter and cheese-making, depend in no small measure on the use and control of the fermentative processes, due to the action of certain bacteria. The Essex County Council Bacteriological Teaching Laboratory is one of the few institutions in England which has realised the importance of some knowledge of bacterial flora in milk on the part of those engaged in the manufacture of dairy products. The apathy of the Government and of most public bodies in this matter is really very lamentable.

In spite of the vast importance of bacteriological knowledge and research, which can only be acquired by patient and long continued observation and experiment in well-equipped up-to-date laboratories, the only substantial support hitherto forthcoming for the advancement of this most important branch of science has been from private sources. This should not be so, and I believe it will not be so in the near future. Already there are signs of an awakening, and when once the State and the people have become impressed with their really intimate relation to, and dependence upon, science, the present regrettable state of affairs will be changed for the better. There are many great problems of interest and of practical and technical importance and advantage awaiting solution or discovery. But this will necessitate the giving-up of time and thought for patient observation and organised experiment on the part of those best fitted to deal with these problems.

Since however, with few exceptions, bacteriology does not pay, how can we expect men who have spent five of the best years of their lives, and about £1,000 in gaining a medical qualification (not to speak of the additional time and expense in acquiring special technical training) to take up such work unless they have private means? In consequence many of the best fitted for this kind of work are

obliged, though reluctantly, to relinquish it. It must necessarily be so until the State and the people recognise the importance to themselves of providing adequate funds for scientific research.

Bacteria and the Preservation of Foods.

It was in 1856 that Pasteur demonstrated that fermentation was bound up with the life and growth of living cells, the cells using a small percentage of the fermentescible material for the purposes of their own growth and nutrition ; while the larger proportion became fermented and transformed chiefly into alcohol and carbonic acid gas. The dependence upon fermentation on living micro-organisms has been fully established.

By the application of these scientific facts and principles we in these days can utilise preserved foods of various kinds.

I cannot here enter into a full discussion of the rôle of bacteria in connection with industrial processes, but I may say that the products of the vital action of bacteria are of an importance in these processes which has not hitherto being sufficiently recognised. Unaware of their agency as we have been, yet we have long been indebted to them. Take for instance, the process of "retting" in the "Maceration industries." The production of indigo depends on the fermentation set up by a special bacterium on the leaves of the indigo plant. The "sweating" of hides and the "curing" of tobacco are other processes which might be mentioned as depending on the action of bacteria. What a lesson as to the value of co-operation ! These minute microscopic plants, so small that millions of them could pass side by side through the eye of a needle, so insignificant individually, achieving so great results when co-operating in countless millions.

Soil bacteria form a subject of great interest and importance to agriculturalists.

Three very important economic groups of bacteria are found in the interstices of soil.

1. Denitrifying bacteria, which break down nitrates.
2. Nitrifying bacteria, which oxidise ammonia and nitrites into nitrates.
3. Nitrogen-fixing bacteria.

Without nitrogen neither plant life nor animal life could continue. Plants get their nitrogen from the soil. Animals are dependent on plants for most of the nitrogen required to build up their bodies. To maintain the cycle of life animal and vegetable refuse should return to the soil. Otherwise the world's stock of available nitrogen must necessarily diminish. The cycle of life may be briefly considered as follows : —

Out of *water*, certain *gases*, and *chemical substances* particularly *nitrates* in the soil, plants build up in themselves more complicated substances suitable for the sustenance of animals. Animal life is not capable of extracting nutriment direct from the soil. It has to depend on the more complex foods built up by vegetables. In all animal life there is a double process going on, a building up, and a breaking down. The products of animal existence are the excretions during life and the final materials of decay after death. To avoid too many technicalities we may state the final products of animal life to be water, carbonic acid, and nitrogenous bodies. The carbonic acid and water can be used immediately by vegetable life. Not so the complex nitrogenous bodies which must first of all be broken down into simpler forms. This is effected by certain decomposition and denitrifying bacteria. The simpler forms include free nitrogen and ammonia. The nitrogen passes into the atmosphere, and is as it were, " lost " to the earth.

The ammonia is oxidised by nitrifying bacteria into nitrates the form in which nitrogen must be for the use of plants, while the free nitrogen which has been " lost " is brought back and fixed in the soil by the nitrogen-fixing bacteria. Were it not for these wonderful little organisms playing their part in the economy of nature, the nitrogen of the soil, the essential element of all life, would gradually become exhausted.

Nitrogen is " lost " in various ways.

1. By decomposition.
2. By explosions.
3. By heavy rains washing away the nitrates in the soil.
4. By the waste of sewage passed into the sea.

If due care is taken and a seaside town is favourably situated, sewage can be effectually disposed of in so far as it might be a nuisance or injurious or dangerous to health, by carrying it out to sea, as in Southend. But the economic question has not been considered in this scheme of sewage disposal. It is a question that, perhaps, will not be of much moment in our day, nor even in our children's day, but as Sir William Crookes, when President of the British Association, pointed out in his Presidential address, at Bristol, in 1898, "the more widely this wasteful system is extended, recklessly sending to the sea what we have taken from the land, the more surely and quickly will the finite stocks of nitrogen locked in the soil become exhausted. Let us remember that vegetation creates nothing in this direction, there is nothing in wheat which is not absorbed from the soil, and unless the abstracted nitrogen is returned to the soil its fertility must be ultimately exhausted. When we apply to the land sodium nitrate, sulphate of ammonia, guano, and similar manurial substances, we are drawing on the earth's capital, and our drafts will not be perpetually responded to. We know that a virgin soil cropped for several years loses its productive powers, and without artificial aid becomes unfertile. Rotation of crops is an attempt to meet the problem, and the four-course rotation of turnips, barley, clover, and wheat bears witness to the fact that practice has been ahead of science in this matter."

Some of the unlimited supply of nitrogen in the air, becomes fixed in the soil, though extremely slowly through various agencies. Certain lichens and algæ absorb a little nitrogen from the air in the form of ammonia and nitric acid. Strong inductive currents of electricity cause the nitrogen to enter into chemical combination with the oxygen of the air in the form of nitrous and nitric acids : but the most considerable and perpetual fixation of atmospheric nitrogen is through the agency of bacteria. Sir John Lawes and Sir Henry Gilbert demonstrated by experiments at Rothamsted, that under the influence of suitable microbe-seeding of the soil in which leguminosæ were planted, there is nodule formation on the roots, and coincidentally, increased growth and gain of nitrogen beyond that supplied either in the soil or in the seed. Presumably this is due to the fixation of free nitrogen by the bacteria when associated with, and growing upon the rootlets of the highly organised leguminous plant.

PART II.

Bacteria as Disease Producers.

Certain bacteria are disease-producers, or, at all events, under certain conditions, become disease-producers. The scientific name for these disease-producing bacteria is "Pathogenic Bacteria." The term is usually applied only to such bacteria as are capable of producing disease in man and animals. There are, however, many other bacteria which produce disease in vegetables, in wines and beer, in milk and butter and cheese, etc. For some reasons it is fortunate that we have these disease-producing bacteria. The presence of these pathogenic bacteria and their power to punish by suffering and death is the most powerful aid Sanitarians have in proclaiming the gospel of cleanliness, and bringing home its importance to the indifferent and careless.

It has been well said "Cleanliness is next to Godliness." If people did not suffer from ill-health and disease in consequence of their indolent, careless, dirty modes of living, we should find it very difficult to bring home the lesson of cleanliness as we sometimes can. Our legislators would have had more difficulty in framing laws for the improvement of slum property were it not that statistics prove that the heaviest incidence of disease in towns is in those parts where ill-ventilated, badly lighted, unclean houses, are all crowded together.

Immorality is another form of uncleanness which sooner or later (generally sooner) brings its punishment with suffering and disease.

Uncleanliness, in a word, engenders all forms of disease, whether it be plague, or cholera, or tuberculosis, or typhoid fever, or any other fever, and the watchword of preventive medicine and the motto of sanitarians may be summed up in the healing command of the Great Physician to the leper, "Be thou clean." When we are clean as individuals, in body and mind, in habits and habitations, we shall be clean as a community. The cleanest towns are those which have the lowest death rate.

No doubt disease may, and does, present itself in cleanly people, living in cleanly, wholesome, well appointed dwellings, but in or near these dwellings there must be foul spots providing the necessary environment for pathogenic bacteria, or the food consumed has been contaminated through dirty sources or unclean storage. So the clean suffer through the unclean ; the innocent through the guilty. All the more incumbent is it on every one of us to inculate at every opportunity the duty of cleanliness. The lesson cannot be learnt in a day, nor a year. Its applications cover a very wide area. Towns and communities can be guilty of uncleanness, as well as individuals. In permitting overcrowding of houses and the erection of back to back houses, authorities in days gone by in certain towns sinned against the law of cleanliness. In consequence, such areas suffer in these towns to-day from an excessive death rate. The greatest cleansing agents in nature, fresh air and sunlight, cannot get at these overcrowded areas to cleanse them. Sunlight is very inimical to bacterial life, and will surely destroy all disease forms if it can only get at them.

Ventilation and Sunlight.

As to fresh air, in other words, ventilation, Sir James Crichton Browne well says that hitherto in "the thick set, dingy working class district of our big towns there have been difficulties in inculcating its merits, for to open the window has often been to admit foul smells, while the construction of the house has inhibited any through current of air. The ventilation of towns seems, therefore, to be a preliminary to the ventilation of houses, and the thinning of towns the first duty of towncraft. The constant immigration into our great towns is a portentous evil. The cry is " Still they come.' "

Southend's Duty.

What we in Southend have got to do is never to allow slums to come into existence ; never to permit the erection of tall blocks of houses which will interfere with a proper amount of sunshine and fresh air ; to see that all future houses are built so as to admit of through ventilation, to provide our working classes with suitable sanitary dwellings, and prevent overcrowding by every means in our power.

Want of ventilation, want of sunlight, and overcrowding are the three main factors which foster the growth of pathogenic organisms. Bad ventilation and overcrowding are sins of uncleanliness. Impure organic excretions, as well as a considerable quantity of moisture, pass from our bodies into the air as long as we breathe. These cling to the walls and the furniture, and the floors, and form an organic film of matter sufficient for the nutrition of millions of bacteria. If a consumptive patient is among the inmates of a house, tubercle bacilli are ejected "on the spindrift of cough," or if he is careless as to his expectoration rise up "in resurgent clouds" from dried up sputa. If the room is not well ventilated, more especially if it is inaccessible to sunlight, the conditions which favour the growth of the tubercle bacillus are present, and such a room becomes a veritable death trap for any susceptible person.

In addition to favouring the growth of pathogenic organisms, overcrowding, and want of ventilation, and absence of sunlight lessen the vital resisting properties of the tissues of those who live under such conditions, so that not only is the seed (the germ) rendered more vigorous, but the soil (the body attacked) is rendered the less vigorous to withstand its growth and more favourable for the acquisition of its virulent properties. As I pointed out in the paper I read before the Sanitary Inspectors' Association on the occasion of their visit to Southend a few months ago, no point bears more strongly on the necessity for the provisions of suitable dwellings for all classes and the destruction of slum property in all towns.

Municipal and personal uncleanliness are undoubtedly the principal evolutionary factors in disease. I am not one of those who believes, for instance, that disease germs entered one by one into the ark to transmit each one its own species unchanged through the ages. It is very questionable if at that early stage of human history any such pathogenic organisms existed, although I have no doubt that their prototypes in the form of harmless saprophytic organisms did exist. As men crowded together and violated the laws of cleanliness, through ignorance or gross neglect, so gradually came into existence the necessary factors which resulted in the evolutionised forms of bacteria which are at the root of infective

diseases. It is our business to see to it, as far as it lies in our power, that evolution should proceed on right lines ; that bacteria shall be our secret friends, and not our secret foes. How interesting and natural and (I say with reverence) divine is the working out of evolutionary law ! In life, as distinguished from death, all processes are gradual. Death may be gradual, but how often is it sudden and catastrophic ? The process of digestion, the healing of wounds, the working-out of ideas, all these are slow, sure, and accomplished by gradual change. The violent earthquake, the rending lightning, the deadly bullet, the avenging sword, all these move swiftly, working destruction, undoing in a moment the work of years, of ages, of epochs.

Creative power is usually manifested by slow, imperceptible processes. Destructive power is usually quick, often instantaneous. It may have taken centuries to evolutionise bacteria. I can destroy them by the million in an instant in a flame.

The destruction of harmful bacilli is, of course, one object in view in the processes of disinfection. An equally important object is the procuring of free ventilation, and the cleansing of the infected room after disinfection ; thus ensuring the removal of conditions favourable to the reproduction of pathogenic bacteria.

Disinfection can be carried out properly only by those who quite understand its aims and requirements. Hence, it is best as a rule that it should be done by the sanitary authority. Unless it is thorough and effectual, it is, like **inefficient vaccination, worse than useless**, because it is apt to engender a sense of security which really is without foundation.

PART III.

Smallpox and Vaccination.

In view of the epidemic of small-pox in the great City with which we are in daily intercourse, I feel it a public duty to say here that the best way to keep this dread disease out of our Borough is for each inhabitant to do his and her best to promote cleanliness, firstly and naturally in our own persons and homes. If, as individuals, and a community, we are clean, we need not dread infectious diseases. This, then, is the first great principle to keep in mind. I should however, be failing in my public duty if I did not impress upon you again that the cleanliness of your own person and home will not necessarily ensure you from acquiring infective disease, unless you are sure that everyone else with whom you come into contact is also clean. Now even in our own Borough there are, unfortunately, some (I am afraid I must say a considerable number) who are not clean. We try our best to induce these people to become clean. The standard of cleanliness with some of them is so low that they consider themselves clean, and are very indignant if it is suggested that they could be cleaner. In other cases we occasionally are obliged to put the machinery of the law into action to compel a certain degree of cleanliness. In the great City of London so vast is the number of unclean people that we actually designate them "the great unwashed," and the condition of some houses (more properly called hovels) is such as to almost defy description. In our intercourse with London, some of us must, therefore, run the risk of coming in contact with the unclean, and possibly, with the bearers of contagion of small-pox.

Now we have not until quite recently enjoyed any reliable means of protection against the majority of infectious diseases, but in efficient vaccination, with lymph procured from a reliable source, we have a means of protection against small-pox which has stood the test of nearly a hundred years. It is not my intention to open

up a controversy on this subject, nor to refer to the usual statistics, dealing to a large extent with unknown factors, such as "said to have been vaccinated," "vaccination not stated," etc.

"Stronger evidence of the value of vaccination is afforded," as pointed out by Dr. W. R. Smith, "from a consideration of the number of persons employed in connection with the small-pox hospitals in London, and the number of those who contracted small-pox ; it being remembered that the Asylums Board insist upon the vaccination or re-vaccination of such persons." The staff newly employed during the last ten years has numbered over 1,200 persons, but there is **no record of a single person, after having been satisfactorily re-vaccinated before entering upon duty, having contracted small-pox.** "Be it noted that no similar immunity from the fevers, including diphtheria, admitted to the institutions of the Board is obtainable, for not a year passes without the loss of valuable lives from such diseases contracted by nurses or others in the performance of their duty."

The fact is, therefore, that in spite of its admittedly great infective power, **small-pox is the safest disease and freest from danger to the efficiently vaccinated** nurses and other members of the Asylum Boards staff whose duty brings them in close and frequent contact with the cases in all degrees of severity.

The point I wish to impress on you is this. If you want to be properly protected from small-pox see to it that you are **efficiently** vaccinated. If your arm does not "take" the first time, do not buoy yourselves up with the false belief that you are not susceptible to small-pox. It is much more probable that the lymph used on you was inert. Insist upon being vaccinated again with lymph which has proved active on someone else. **An unsuccessful vaccination or re-vaccination should always be regarded with great suspicion and should on no account be considered as proof that the subject is insusceptible to small-pox.**

Another point is this. As a general rule, efficient vaccination confers an immunity which lasts for a considerable time, it may be for years, but **the immunity gradually lessens.** It may be considered absolute for a year or two, and then it gradually becomes

less complete. Therefore to ensure absolute immunity in face of an epidemic, recent efficient re-vaccination is essential. Vaccination is our first line of defence against small-pox. The exigencies of life and business necessitate our coming into contact at times with the unclean and contaminated. By being vaccinated, we not only protect our own bodies from a loathsome disease, but our homes and borough from many a probable source of introduction of small-pox. If ever the time comes when all people and towns are clean, the necessity for vaccination will pass away. In the meantime it is a public duty. Compulsion should not be necessary. Each person should feel it his duty to his neighbour and his fellow townsmen to be protected from being a source of introduction of so hideous a disease.

PART IV.

How to keep Cleanliness in a Household.

1. Wash frequently everything that is washable.
2. Clean out every room as often as possible.
3. If there has been any illness in a room **do not dry-sweep** or dry-dust that room, **but use a damp cloth** for removing the dust. This is to prevent the sweeping up of germs into the air. Germs will adhere to a damp cloth, which can then be boiled or soaked in a strong disinfectant solution.
4. Ventilate every room every day and expose, if possible, to sunshine.
5. Avoid dark and heavy curtains.
6. Have all cooking utensils, and every jug or other utensil used for storage of milk or other perishable food scrupulously clean.
7. Take only sufficient milk for the day's use, and cleanse every utensil used for milk with boiling water, after use every day.
8. Keep stored milk covered over in as cool and dust-free position as possible.
9. See that you get your milk from clean dairies and enquire whether your milk can is properly scalded out with boiling water every day.
10. Burn all vegetable and animal refuse. Do not throw these into the dustbin.

I have laid some stress on the importance of guarding milk from all possible sources of contamination, because milk is an ideal nutritive medium for bacteria. They multiply in milk at an astonishing rate. For this reason, also, milk that has stood overnight, should

not be utilised without previous boiling. Preferably no milk should be kept overnight. If it is necessary to keep it, it should be boiled and covered over to keep out dust and germs, particularly in a sick room.

Bacteriology.

By the aid of bacteriology in certain doubtful cases, not only can diseases be more quickly and certainly detected in an individual to his benefit as regards treatment, but also to the benefit of the public health generally, in enabling the Medical Officer of Health sooner to become acquainted with centres of infection, and consequently to take measures of prevention at an earlier stage than could otherwise be done.

The importance of bacteriology from a sanitary point of view cannot, indeed, be overstated, and it is a pleasure to me to devote such knowledge of the subject as I possess to the good of this town in general and of the individuals unfortunately attacked with infective diseases in particular.

Facts Concerning Infectious Diseases.

1. Infectious diseases are chiefly spread by the conveyance of germs from the sick to the healthy.
2. Frequently persons (particularly in the case of children), though apparently in good health, and recovered from an infectious complaint, may still carry the germs about them and infect others.

How the Public can Help in Arresting the Spread of Infectious Diseases.

Necessary Precautions.

1. Do not allow healthy and sick children to play together nor even to be in the same room, pending medical advice.
2. After use by a sick person, scald all cups, spoons, etc., with boiling water or soak in strong disinfectant.
3. If an epidemic is prevalent call in medical advice early if a child is languid, especially if there is any sore throat, or lumps in the neck, or vomiting, or headache, or fever.

4. Diphtheria frequently commences in a child without any other symptoms than languor and pallor. If, in addition, any specks can be seen inside the child's throat, or lumps felt outside, send for a doctor without delay. The earlier a case of diphtheria can be treated medically, the greater the chance of saving the child. If the fluid known as anti-toxin could be injected in every case on the first day of illness, deaths from diphtheria would be practically unknown.

5. Anti-toxin has another virtue. It will generally prevent children who have been exposed to infection through contact with another child suffering from diphtheria from contracting the disease. It will in any case render an attack very mild.

When diphtheria occurs in a household it is a wise precaution to ask the doctor to give all the other inmates a prophylactic dose of anti-toxin. The immunity against diphtheria given by this lasts only about a fortnight.

6. After a child has been removed to hospital or declared free from infection, no one should be permitted to occupy the sick room until it has been properly disinfected and subsequently cleansed and well ventilated. Every article in the room should be disinfected.

7. If a patient is nursed at home, have a separate special set of cups, spoons, etc., for use in sick room.

8. These should be treated as described in precaution No. 2 before they leave the room.

9. No person except the nurse, or person who is acting as nurse, should go into the sick room except by special permission of the doctor.

10. Whoever enters the sick room should take every precaution not to come within the line of breath of the patient, especially if there is any cough.

11. The hands should be invariably well washed before leaving the sick room.

12. The nurse or person acting as nurse should have nothing to do in the way of assisting, feeding, or nursing any other person in the house.

13. It is a wise precaution to boil all milk before use during an epidemic.

14. Keep the sick room and the rest of the house as well ventilated as possible.

15. There should always be a fire in the sick room. It helps ventilation, and, moreover, is not only necessary for warmth, but is convenient for destroying all infected rags and papers, cotton wool, etc.

16. Even after an apparent recovery from an infectious disease, convalescents should not play with other children, or go to school or church or parties, or meetings of any sort, for at least a fortnight or three weeks.

17. Consumption of the lungs should be regarded as an infectious disease so far as the expectoration of the patient is concerned. A consumptive patient should never spit carelessly, because his expectoration is generally loaded with myriads of the germs of the disease. He should be provided with a bottle containing a small quantity of a strong disinfectant (one part carbolic acid to 20 parts of water) or with Japanese paper handkerchiefs to receive all expectoration. The bottle can be cleansed by boiling, while the paper handkerchiefs can be burnt.

18. A consumptive patient should occupy a separate bedroom, and precaution No. 2 applies to this case.

19. Whenever a child breaks out in an eruption, seek medical aid. What you consider to be chicken-pox or measles or eczema might be small-pox.

Measles.

A great many people think lightly of measles and neglect to call in medical aid until too late. It cannot be too emphatically stated that measles is responsible for a high death rate among young children and requires skilled treatment.